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Thomas Evans

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EXAMINER

GAKH, YELENA G

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/723,810	<b>Applicant(s)</b> EVANS ET AL.	
	<b>Examiner</b> Yelena G. Gakh, Ph.D.	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 January 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-37, 39 and 40 is/are pending in the application.
- 4a) Of the above claim(s) 9, 10, 21, 23 and 24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 11-20, 22, 25-37, 39 and 40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>01/30/08</u> .  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. Amendment filed on 01/25/08 is acknowledged. Claim 38 is cancelled, and claim 40 is added. Thus, claims 1-37 and 39-40 are pending in the application. The Applicants elected resonance spectroscopy methods as the forensic analytical technique, fluorescence spectroscopy as the dynamic technique, and DMBPC polymer as a polymer species. In response to the Applicants' remarks that although they elected DMBPC as the polymer species, the withdrawn claims 21 and 23-24 still read on the elected species, the examiner respectfully disagrees. The withdrawn claims recite different species of polymers from the one elected, in particular, claim 21 recites DDDA, claim 23 recites a polymer represented by the structural formula in the body of the claim, and claim 24 recites ITR-PC copolymer. These are totally different species from DMBPC polymer and require different search, thus creating a burden for the examiner. The examiner has indicated as to why these species are different, patentably distinct and require a separate search, which makes the restrictions requirements proper and FINAL. Thus, claims 9-10, 21 and 23-24 are withdrawn from consideration. Claims 1-8, 11-20, 22, 25-37 and 39-40 are considered on merits.

### ***Response to Amendment***

2. All objections and rejections established in the previous Office action are sustained.

### ***Drawings***

3. Figure 2 is objected to as being of a poor quality. The Applicants are advised to resubmit the drawing with the spectrum comprising clear signals and captions.

### ***Claim Objections***

4. Claim 17 is objected to because of the following informalities: it should recite “(-CH<sub>2</sub>-)<sub>n</sub>” instead of “-(CH<sub>2</sub>)-n”. Appropriate correction is required.

### ***Specification***

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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A. The specification is objected to as not written in such full, clear, concise and exact terms as required by the first paragraph of 35 U.S.C. 112. In particular, such terms as “a forensic authentication marker”, “a dynamic response authentication marker”, as well as “forensic analytical technique” and “dynamic response analytical technique”, which are essential for understanding and performing the claimed method, are not defined clearly and unambiguously in the specification. For example, “forensic authentication markers” are defined as “one or more organic or inorganic functional groups or structures that are not originally present in the chemical structure of the substrate polymer” having a unique signal detectable by a forensic analytical method (paragraph [0036]). This is a conventional definition for all markers, since all markers, tags or labels are the groups or materials that are not a part of the original material and which should have a unique signal detectable by an analytical method, in particular, spectroscopically. It is not clear, how this definition is different from a definition given for “a dynamic response authentication marker”: “dynamic response authentication marker as used herein refers to spectroscopic tags, thermochromic compounds and optically variable tags”. First of all, it is not clear, what the “spectroscopic tags” might be? All functional groups are detectable by one or another spectroscopic method. Does it mean that any group can be a “spectroscopic tag”? Furthermore, all listed tags, i.e. “spectroscopic tags, thermochromic compounds and optically variable tags” are not present in the original compounds, and therefore may be considered “forensic authentication markers”, according to the definition of these markers.

The same ambiguity and unclarity is found for definitions of “forensic analytical technique” and “dynamic response analytical technique”. The examiner provides complete paragraph [0063] defining “forensic analytical technique”: “[0063] Forensic analytical techniques as used herein refer to analytical methods that generally require significant expenditures with respect to equipment and/or preparation and are capable of detecting a forensic authentication marker in the amounts used here such that they produce a signal or response that confirms the presence of the forensic authentication marker in the tagged polymer. Illustrative examples include resonance spectroscopy methods such as nuclear magnetic resonance (NMR) and electron spin resonance (ESR), x-ray photon electron spectroscopy- electron spectroscopy for chemical analysis (XPS-ESCA), energy dispersive x-ray spectroscopy (EDX) coupled to scanning electron microscopy (SEM- EDX), atomic absorption, and the like. Methods such as

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NIR, MIR, FTIR, x-ray irradiation, mass spectroscopy, and neutron spectroscopy are not within the scope of forensic analytical techniques”. The examiner does not quite understand a distinction that the Applicants provide for the techniques that are considered “forensic analytical techniques”, and those, which are not considered as such. For example, NMR cannot be considered a very sensitive method. Therefore, in order to detect a “forensic authentication marker” being just a functional group in the NMR spectrum of the original polymer, such label should be present in the same amount as the polymer itself. Also, it is not apparent as to why such complex and involved techniques as mass spectrometry or X-ray analysis, or neutron spectroscopy, which also “require significant expenditures with respect to equipment and/or preparation”, are not included in the set of “forensic analytical techniques”? The distinction between the analytical techniques, which are considered to be “forensic analytical techniques” and those, which are not considered as such, is unclear and indefinite. Furthermore, all fluorophores, which are considered “dynamic response authentication markers” will give significant and definite signals in NMR spectra. Then why cannot they be considered “forensic authentication markers”?

B. In paragraph [0097] the specification discloses: “In another embodiment, the optically variable tag will be present in the tagged polymer in an amount of less than or equal to about  $10^{-18}$  % by weight, based on the total weight of the tagged polymer. In one exemplary embodiment, the optically variable tag will be present in the tagged polymer in an amount of less than or equal to about  $10^{-12}$  % by weight, based on the total weight of the tagged polymer. In yet another exemplary embodiment, the optically variable tag will be present in the tagged polymer in an amount of less than or equal to about  $10^{-6}$  % by weight, based on the total weight of the tagged polymer. In one embodiment, the optically variable tag will be present in the tagged polymer in an amount of at least 0.0001% by weight, based on the total weight of the tagged polymer. In another embodiment, the optically variable tag will be present in a tagged polymer or article, such as an optical storage disk, at a loading between 0.0001% and 0.05% by weight, based on the weight of the tagged polymer”. The examiner did not find the promised examples for loadings of the tag of  $10^{-4}$  wt.%, not mentioning  $10^{-6}$  wt.%,  $10^{-12}$  wt.%, or  $10^{-18}$  wt.%. The examiner respectfully requests the Applicants to provide any evidence for detection sensitivity of

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any optical technique in the indicated ranges. It appears that the Applicants suggest measuring femtograms of the taggant in kilograms or tons of the polymer.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 15 and 34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification does not disclose any “forensic analytical methods”, which allow detecting the forensic authentication marker in less than 0.005 wt.% of the total weight of the polymer. For example, the accuracy of integral errors for NMR spectra are 10-15%, and therefore it is not apparent, as to how the forensic authentication tags can be detected in the amount of less than 0.005% from the total weight of the polymer. The specification does not provide enablement for claim 34, since the only examples for “forensic analytical technique” are related to NMR spectroscopy, which is not able to detect less than 1% of the compound in a mixture relative to the total amount of the polymer. No other “forensic analytical techniques”, which would have sensitivity high enough to detect 0.005 % w/w of forensic authentication marker, are indicated in the specification.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1-8, 11-20, 22, 25-37 and 39-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims recite the subject matter, which is not clearly and definitely disclosed in the specification, including such essential definitions as “a forensic authentication marker”, “a dynamic response authentication marker”, “forensic analytical technique” and “dynamic response analytical technique”. Since these two types of markers and corresponding analytical

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techniques are not clearly defined in the specification and are not definitely discerned from each other, the examiner considers any two analytical techniques, including optical techniques using different wavelength ranges, corresponding to these definitions. Moreover, since forensic authenticating marker and dynamic response authentication marker can be just functional groups and thus can belong to the same compound, the examiner considers one compound, which can be detected by two optical techniques, meeting the description of two markers.

Claim 2 is not clear. How can authentication marker affect the optical property of the substrate material? By having an overlapping signal with that of the substrate material? The claim is not clear. The same is true for claims 3-6.

In claim 7 it is not quite apparent, which resonance spectroscopy methods are meant in the claim. The examiner considers all methods based on resonance meeting the description of the “resonance spectroscopic method”, including Raman resonance spectroscopy.

Claims 11-15 recite specific content of the forensic authentication marker in wt.% relative to the tagged polymer. Since in dependent claims 16-17 the forensic authentication marker is recited as functional group, it is not clear, as to how such weight percentage is obtained.

Regarding claim 16, the examiner wonders, how is it possible to have a forensic authentication marker, which is an alkyl group of 2 or more carbon atoms, which is not present in the polymer? To the examiner’s knowledge, all organic polymers comprise alkyl groups with at least two carbon atoms.

The recitation of claim 18 is confusing. Does it recite two polymers, one overlaying another one, with the first polymer being a substrate polymer, and the second polymer comprising the fluorescent authentication marker?

Claim 19 is unclear as to what is meant by the limitation “wherein the polymer is miscible with polycarbonate”. How one polymer can be “miscible” with another polymer? The term “miscible” is conventionally applied to solutions or melts, which do not appear to be recited in the claim. Clarification is requested. It is also unclear, as to how polycarbonate is related to the subject matter of the preceding claims.

From claims 20 and 22 it is not clear, which copolymers are recited in the claim, since only one polymer is indicated for each copolymer. Moreover, the abbreviations for polymers

names, specifically “DMBPC”, are unconventional abbreviations. The complete chemical names of the polymers should be recited in the claims. Furthermore, it is not apparent as to which are the specific forensic authentication markers related to the compounds listed in claims 20 and 22.

Claim 33 is not clear in regards to performing the step of authentication of a tagged article. The examples in the specification comprise dissolving the material to analyze the polymer with NMR spectroscopy (“the forensic analytical technique”), which contradicts the subject matter of claim 33. According to claim 33 the article should not be destroyed in order to be authenticated, otherwise the article will not be authenticated as the “tagged article”. Also, the word “incorporating” assumes that something is being incorporated into something. From the claim it is not clear, as to what is incorporated into what. The language of the claim renders it unclear and indefinite.

Claims 39 and 40 have the same flaws in their recitation as the preceding claims.

### ***Claim Rejections - 35 USC § 102***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. **Claims 1-8, 11-14 and 16-19** are rejected under 35 U.S.C. 102(b) as being anticipated by Livesay (US 1,487,967, IDS).

Livesay discloses a method for authentication that a test polymer is a tagged polymer, with a tagged polymer comprising any of polymers disclosed on pages 1 and 2, the tags comprising microparticles of a distinctive shape or size (detected by a dynamic response analytical technique, such as visible optics) and comprising specifically coded tagging elements (detected by forensic analytical technique, such as electron paramagnetic resonance spectroscopy, page 2, line 114). The microparticles do not affect any properties of the tagged polymer recited in claims 2-6. “Each tagging element should be incorporated in an amount of at least 0.1 percent of the total weight” (page 2, lines 89-90). The tagging material includes Si (see



Table on page 3). Since the tagged polymer can be polyethylene, the forensic authentication marker includes the group consisting of  $(-\text{CH}_2-)_n$  groups, with  $n$  over 4.

12. **Claims 1-6, 16-19, 30-31, 33, 35-37 and 39-40** are rejected under 35 U.S.C. 102(b) as being anticipated by Matsumoto et al. (SPIE, 1998).

Matsumoto teaches “a clone preventative technique which features magnetic micro-fibers and cryptography”, comprising incorporating micro-fibers containing iron oxide particles (forensic authentication marker), which can be detected with micro-fibers detector (forensic analytical technique), into polymer substrate such as polycarbonate (see page 277), and using the digital signature (a physical dynamic response authentication marker) utilizing asymmetric cryptography (dynamic response analytical technique) (see page 282). The markers do not alter the substrate parameters recited in claims 2-6. Micro-fibers comprise such polymeric fibers as PET, acrylic fibers, etc., comprising the functional groups recited in claims 16-18 (page 277). They are miscible with polycarbonate, which is used as one of the substrates (see above). The method is applied to molded articles such as plastic cards.

### ***Claim Rejections - 35 USC § 103***

13. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

14. **Claims 1-8, 11-20, 22, 25-37 and 39-40** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cyr et al. (US 6,099,930, IDS) in view of Davis et al. (6,001,953, IDS) and e.g. Buess et al. (US 6,411,208).

Cyr teaches “methods for marking digital compact discs as a means to determine its authenticity”, wherein the methods comprise incorporating a near infrared fluorophore into the CD by “coating, admixing, blending or copolymerization and in an amount to impart a detectable fluorescence from the fluorophore when exposed to electromagnetic radiation” (Abstract). Fluorophore is a dynamic response authentication marker. “A preferred material for use as a substrate is a thermoplastic, desirably, polycarbonate having the near infrared fluorophore incorporated therein. The near infrared fluorophore composition can be copolymerized with the polycarbonate, admixed into the polycarbonate, or coated onto the surface of the polycarbonate. If the latter application methodology is chosen and the near infrared fluorophore is coated onto

the substrate layer 12, it is preferable that the near infrared fluorophore be located adjacent to the second surface 15 of the substrate 12” (col. 3, lines 49-59).

Cyr does not specifically teach a different forensic authentication marker and using a different analytical technique for further authentication.

Davis discloses various compositions used for manufacturing optical articles based on polycarbonates, including DMBPC (col. 21, Example 8). Since the content of such compositions is optimized for obtaining the best properties required for specific applications of CD and therefore the compositions are specific, it would have been obvious for any person of ordinary skill in the art at the time the invention was made to use the composition of the articles as an authentication signature; it is especially true, since such analytical techniques as NMR or NQR are well known for obtaining authentication signatures, as disclosed e.g. by Buess et al.

Therefore, it would have been obvious for a person of ordinary skill in the art to use two authentication techniques for such molded articles as CDs - the one based on fluorescence detection of fluorescence label incorporated into the CD polymer, as taught by Cyr, and the second based on the specific composition of the CD material disclosed by Davis, which can be obtained by analytical techniques well known for providing authentication signatures of the materials, such as NMR, EPR, etc., as indicated by Buess, because this enforces authentication capabilities and enhances prevention of forgery or counterfeiting. It would have been obvious for any person of ordinary skill in the art to optimize the amount of the markers in order to make them detectable (depending in the sensitivity of the analytical technique) and, on the other hand, not interfering with the substrate.

### ***Response to Arguments***

15. Applicant's arguments filed 01/25/08 have been fully considered but they are not persuasive. Information Disclosure Statement. The Applicants request the examiner to consider two references from IDS filed on 07/18/05. The examiner indicated that the references had not been considered as being irrelevant to the subject matter of the instant application. The examiner will consider the references if the Applicants explain, as to how reference DE1011851 directed toward "Process for the manufacture of a binding material for the briquetting of powdered fuels" (Title) and EP0698419B1 directed toward "System for spraying dry building materials, in

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particular for applying sprayed concrete and spray motor by a dry spraying material ..." (Claim 1) relate to "the method of authenticating that a test polymer is a tagged polymer ...", comprising the recitation of any claim of the instant application.

Objection to the specification. The Applicants state that the definitions for "forensic authentication markers" and for "dynamic response authentication markers", as well as for corresponding techniques are clear from the specification. The examiner respectfully disagrees. The Applicants indicate that the examiner did not provide a full explanation for the forensic authentication marker provided in the specification. The examiner provides the full paragraph for definition of the "forensic authentication markers":

"[0036] Forensic authentication markers as used herein refers to one or more organic or inorganic functional groups or structures that are not originally present in the chemical structure of the substrate polymer in an amount or configuration detectable by a forensic analytical technique but which, when incorporated with the substrate polymer, result in a tagged polymer that has a unique signal detectable by a forensic analytical method. For example, although certain functional groups may be present in the substrate polymer, for example, methylene groups, it is an aspect of the disclosed methods that they may not be present in the substrate polymer in the same amount or configuration that gives rise to detection by a forensic analytical method and the subsequent identification of a particular structure and configuration as a forensic authentication marker. Thus, in one exemplary embodiment, the substrate polymer is substantially free of forensic authentication markers prior to the formation of the tagged polymer. In another exemplary embodiment, the substrate polymer will be substantially free of the forensic authentication marker intended to be detected by the forensic analytical technique".

The definition of the "forensic authentication marker", provided in paragraph [0036] can be associated with any marker, tag or label for a compound, since any marker, tag or label for the compound by definition should not be present in the original compound and should have a characteristic fingerprint upon detecting with a specific analytical technique (see definition of a marker in any on-line dictionary). Thus, it appears that what the Applicants call "a forensic authentication marker" is in fact a conventional molecular marker, e.g. a chemical group which can be identified by a specific analytical method when inserted within the compound. If the Applicants have a different definition for a conventional molecular marker, the examiner respectfully requests the Applicants to provide such definition or an example of such marker, which would be different from the "forensic authentication marker" of the instant application.

Regarding the definition of a "dynamic response authentication marker", the Applicants indicate that the definition is provided in paragraphs [0064]-[0073], in particular they indicate:

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"[0064] Dynamic response authentication marker as used herein refers to spectroscopic tags, thermochromic compounds and optically variable tags". Furthermore, the Applicants indicate that "spectroscopic tags make it possible to determine thermal history and degradation of a polymer". First, it is not clear, as to how "spectroscopic tags", which are disclosed as "dynamic response authentication markers [that] include organic, inorganic, or organometallic fluorophores" [0073] differ from optical markers, because fluorophores *are* optical markers. Second, it is unapparent, as to how these markers can determine degradation of a polymer [Applicants' remarks, page 13] if what will be detected are the changes that the markers undergo themselves, rather than the changes occurring with the polymer comprising these markers. The Applicants further indicate that "[o]ptically variable tags are described in the specification generally as fluorescent or luminescent materials that are selected to be chemically compatible with the polymer matrix and have a heat stability consistent with engineering plastics compounding and in particular with the processing conditions of the polymer substrate". Does it mean that the spectroscopic markers, which are also fluorescent or luminescent materials, are not selected "to be chemically compatible with the polymer matrix and have a heat stability consistent with engineering plastics compounding and in particular with the processing conditions of the polymer substrate"?

It is further unclear, as to what are "dynamic response analytical methods"? All analytical methods are in fact "dynamic response analytical methods", since all disclosed methods, whether they are listed as "forensic analytical methods" or "dynamic response analytical methods", including NMR, EPR, etc., are analytical methods which are responsive to dynamic processes occurring with the material. If the Applicants meant to discern between optical spectroscopic methods, in particular fluorescence and luminescence, and other spectroscopic methods, then this should have been clearly reflected in the specification.

Rejection of claims 15 and 34 under 112, first paragraph. The Applicants disagree with the examiner's rejection of the claims as not being enabled by the disclosure. The examiner has indicated that such "forensic analytical method" as NMR has integral accuracy of about 10%, and therefore it is totally unapparent as to how such accuracy of measurement as 0.005 wt.% can be reached for detection of the marker, not mentioning such incredible sensitivity and accuracy of the methods as detecting  $10^{-14}$  wt.% (the claims recite  $10^{-18}$  wt.%!). The Applicants write:

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"Applicants respectfully disagree and submit that the forensic analytical methods disclosed allow detection of the forensic authentication marker in less than 0.005 wt.% of the total weight of the polymer. The methods described in the specification are able to detect the forensic authentication marker in amounts as low as  $10^{-14}$  wt.% by utilizing a solvent method and then concentrating the solvent. Thus, the forensic authentication tags can be detected in the amount of less than 0.005% from the total weight of the polymer". The examiner respectfully requests the Applicants to elaborate, as to how the "solvent method" is related to the instant application, since no "solvent method" is disclosed in the specification; how it can be called "nondestructive authentication technology", which is the essence of the instant method (see [0001] of the specification), and how it would be possible to detect marker in the amount of  $10^{-14}$  ( $10^{-18}$ ) wt.% of the polymer, even under assumption that the extraction of the tag from the polymer is possible? A simple calculation for an average mol. weight of the polymer of  $\sim 100$  kDa (corresponding to  $10^5$  g/mol) indicates that in order to detect 1  $\mu$ mol of the marker, which can be considered a sensitivity limit for the "forensic analytical techniques" disclosed in the specification, there should be taken  $10^{15}$  g of the polymer: detecting  $10^{-6}$  mol (1  $\mu$ mol) of the marker corresponding  $10^{-18}$  wt.% or  $10^{-20}$  ratio to the polymer of average weight 100 kDa means that there should be taken  $10^5/10^{-20}$  g =  $10^{15}$  g =  $10^{12}$  kg or  $10^9$  ton of the polymer. The examiner respectfully requests the Applicants to provide at least one example of such detection.

Rejection of the pending claims under 112, second paragraph. A plurality of embodiments providing examples of key terms that lay in the grounds of the invention, such as "forensic authentication marker", "dynamic response authentication marker", and corresponding techniques, cannot be called clear and unambiguous definitions of these terms, as was indicated above. The Applicants confirm unclarity and indefinites of these expressions by further indicating that the markers can react with the substrate material. This is an unconventional definition of the term "marker", because conventional markers, while can be incorporated into compounds, are not supposed to change their properties. If the markers are in fact reagents that change the properties of the compounds which they are supposed to mark, then it is not clear, as to why they are called "markers", rather than the reagents.

Regarding the definition of "resonance spectroscopy", providing examples of "resonance spectroscopy" "such as NMR and EPR" in the specification is not equivalent to defining this

expression in clear and definite terms. There are many other resonance spectroscopies, such as acoustic resonance spectroscopy, resonance Raman spectroscopy (which would probably belong to the second group of "dynamic response analytical techniques"), X-ray resonance scattering, etc. Therefore, the definition of "resonance spectroscopy", especially with such unclear and indefinite differentiation between "forensic analytical technique" and "dynamic analytical technique" cannot be called clear and definite.

Regarding claims 11-15, the explanation of the Applicants of the application of solution NMR in the instant method contradicts the purpose and essence of the method disclosed in [0001]: "The invention particularly relates to **nondestructive** authentication technology for use in data storage media made of polycarbonate such as compact disks (CDs) and digital versatile disks (DVDs)". Moreover, the examiner specifically indicated that NMR could not be considered an accurate method for quantitative measurements, especially of polymer samples. Integral intensities used in NMR for measuring relative amounts of compounds have an average error of 3-10%. The Applicants did not provide any evidence for the opposite.

Regarding the presence of "forensic authentication marker" having alkyl group of 2 or more carbon atoms (Claim 16), the examiner is not sure, as to how such group can be identified in NMR spectrum of a polymer which has hundreds of thousands of such groups which give so called "methylene envelope" in the spectrum with a significant overlap of methylene signals. Moreover, a definition of the forensic authentication marker as having a distinct signature compared to the polymer contradicts the disclosure provided in paragraph [0036].

Regarding claim 18, it is not clear, whether the claim recites a sandwich-type structure, which has a substrate polymer overlayed with the polymer comprising the forensic authentication marker? It appears that the claim recites two different polymers, and therefore it is not apparent, as to which "tagged polymer" is recited in the preamble of the claim.

Regarding "miscibility" of the polymers (Claim 19), the examiner wonders, as to where the polymers are disclosed as being in the forms of liquids or melts in order to be mixed with each other? The examiner failed to find such disclosure.

Claims 20 and 22 are unclear and indefinite, since defining only one polymer out of two or more polymers for reciting copolymers cannot be considered a definite and clear description of the copolymer. As the Applicants correctly indicated, "copolymer as defined herein refers to a

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material having more than ten total repeating units where in at least two of other repeating units are different". The lack of indication, which other repeating units these might be makes it unclear, as to which materials are recited in the claims, which renders the claims unclear and indefinite.

Regarding claim 28, the examiner already provided her arguments of a total improbability of such number.

Regarding claim 33, the recitation "incorporating together a polymer and a compound comprising a forensic authentication marker and a dynamic response authentication marker" is different from a description of "incorporating the forensic authentication marker and dynamic response marker *into* the substrate polymer" provided in the specification, and is much less clear. Also, the claim does not seem to be supported by the specification, because the specification does not provide any guidance for authenticating the article with disclosed forensic analytical techniques. The only examples provided in the specification relate to liquid NMR analysis, which cannot be considered a nondestructive forensic analytical technique.

Rejection over the prior art.

Regarding Livesay's reference, the Applicants argue that Livesay does not teach all the limitations of claim 1, in particular "Livesay fails to disclose various elements of the claims including, "[a] method of authenticating that a test polymer is a tagged polymer, said tagged polymer comprising a substrate polymer, a compound comprising a forensic authentication marker, and a dynamic response authentication marker..." (Claim 1) Livesay also fails to disclose "...testing the test polymer for the forensic authentication marker using a forensic analytical technique..." or "...testing the test polymer for the dynamic response authentication marker using a dynamic response analytical technique..." and "authenticating that a test polymer is a tagged polymer if the forensic authentication marker and dynamic response authentication marker are detected." (Claim 1)". The examiner respectfully disagrees. As it was indicated in the previous Office action and is repeated in the present Office action, "Livesay discloses a method for authentication that a test polymer is a tagged polymer, with *a tagged polymer comprising any of polymers disclosed on pages 1 and 2, the tags comprising microparticles of a distinctive shape or size (detected by a dynamic response analytical technique, such as visible optics) and comprising specifically coded tagging elements (detected by forensic analytical technique, such as electron*

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*paramagnetic resonance spectroscopy, page 2, line 114*). The microparticles do not affect any properties of the tagged polymer recited in claims 2-6. "Each tagging element should be incorporated in an amount of at least 0.1 percent of the total weight" (page 2, lines 89-90). The tagging material includes Si (see Table on page 3). Since the tagged polymer can be polyethylene, the forensic authentication marker includes the group consisting of  $(-CH_2-)_n$  groups, with  $n$  over 4". Thus, Livesay discloses both types of markers and both types of analytical techniques, which fully meet the description of corresponding markers and techniques provided in the instant disclosure.

Regarding Matsumoto's reference, the Applicants argue that magnetic micro-fibers containing iron oxide particles are not "forensic authentication markers" and specific pattern of the disposition of micro-fibers and iron oxide particles (a signature) is not a dynamic authentication marker. The examiner respectfully disagrees, since nothing in the disclosure prevents such micro-fibers with iron oxide particles from being used as forensic markers. Their specific pattern of disposition is a dynamic authentication marker, since e.g. thermal exposure will change the specific pattern of disposition and therefore the digital signature will be changed, which is a characteristic of the dynamic authentication marker. Moreover, the pattern can be observed optically (visually), and the micro-fiber detection corresponds to the description of the forensic analytical technique.

Regarding rejection of the combination of references by Cyr, Davis and Buess, the examiner respectfully disagrees with the Applicants' arguments that the examiner did not establish a *prima facie* of the obviousness of such combination. Cyr directly teaches incorporating dynamic authentication marker which can be detected by dynamic analytical technique into the polymer of CD. Davis discloses optimization of compositions of the material for CDs based on polycarbonates, including DMBPC, which makes these compositions very specific for CDs, and which therefore would directly lead any practitioner in the art to an idea of using the specific composition of CDs as another marker for their authentication. The examiner disagrees with the Applicants' remark that "OA relies on Davis simply to disclose that DMBPC can be used in a composition of polycarbonate". This is not what the examiner emphasized in the previous and present Office actions. The examiner has specifically indicated that Davis discloses optimized and well defined compositions based on polycarbonate DMBPC polymer for



producing CDs, with the compositions having unique and characteristics properties. Buess discloses that such forensic analytical techniques as NMR and NQR are very efficient in obtaining signatures for the composite materials. Thus the combination of Cyr's authentication method of CDs material with optimization of CDs materials disclosed by Davis, with Davis' materials having unique chemical compositions with optimized physical-chemical characteristics, and a direct guidance of Buess for obtaining fingerprints of composite materials using such forensic analytical techniques as NMR, makes it obvious for a person of ordinary skill in the art to authenticate CDs using double marker, comprising the marker disclosed by Cyr and unique composition of the CD material disclosed by Davis with a clear motivation of reinforcing authentication capabilities and enhancing prevention of forgery or counterfeit of CDs. The Applicants did not specify, as to why such combination would not have been obvious for a person of ordinary skill in the art, thus making the claimed invention non-obvious for any routineer in the art.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yelena G. Gakh, Ph.D. whose telephone number is (571) 272-1257. The examiner can normally be reached on 9:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Yelena G. Gakh/  
Primary Examiner, Art Unit 1797

4/21/2008